Cross-sectional Study

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# An institutional experience of hydatidosis and cysticercosis in Nepal: a retrospective chart review

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**Background:** This study aimed to investigate the demographic characteristics, anatomical distribution, and histopathological features of hydatidosis and cysticercosis in a Nepalese population presenting to a tertiary care hospital. The study also aimed to provide a better understanding of the clinical and pathological aspects of these diseases in the local context.

**Methods:** This retrospective study analyzed all cases of hydatidosis and cysticercosis reported in the Department of Pathology at Tribhuvan University Teaching Hospital between January 2013 and December 2019. Demographic, clinical, radiological, and histopathological data were collected and analyzed from hospital charts.

**Results:** During the 7-year study period, the authors identified 112 cases of hydatid cysts and 26 cases of cysticercosis. The mean age of patients with hydatidosis was 33.86 years (range: 5–74 years), while the mean age of patients with cysticercosis was 25.39 years (range: 4–63 years). Females were more commonly affected with hydatidosis (68, 61.7%) than males (44, 39.3%), resulting in a male-to-female ratio of 0.6:1. In contrast, there was no significant sex difference in cysticercosis cases, with 14 (53.85%) males and 12 (46.15%) females affected. The most commonly affected site for hydatid cysts was the lung (47 cases, 42%), followed by the liver (41 cases, 36.6%). The study identified three cases of neurocysticercosis. The average diameter of hydatid cysts and cysticercosis was 8.7 cm and 1.7 cm, respectively.

**Conclusion:** In conclusion, our study provides important insights into the clinical and pathological features of hydatidosis and cysticercosis in a Nepalese population. These zoonotic diseases pose a significant health burden, particularly among the poor and marginalized populations. Our findings highlight the need to integrate prevention and control measures into the healthcare system to decrease the overall burden of these diseases.

**Keywords:** cysticercosis, hydatidosis, Nepal, neurocysticercosis

## Introduction

Cestode larvae can cause various human diseases, with cystic echinococcosis (caused by Echinococcus granulosus), alveolar echinococcosis (caused by Echinococcus multilocularis), and cysticercosis (caused by Tenia solium) being the most relevant. These infections are prevalent worldwide, but are more common in developing countries due to poor hygienic conditions that facilitate transmission[1]. Hydatid disease (HD) is proclaimed to be regional in Australia, New Zealand, the Middle East, India, Africa, South America, and Turkey[2]. Likewise, *T. solium* cysticercosis is endemic in Africa, Latin America, and Asia[3]. Hydatid cysts may develop in any organ but occur most frequently in the liver followed by the lungs and occasionally other organs[4]. Neurocysticercosis (NCC) is considered to be the most prevailing parasitic infestation of the central nervous system[5]. Nepal, like many other developing countries, is also affected by the prevalence of cystic echinococcosis, alveolar echinococcosis, and cysticercosis due to poor hygiene and

### HIGHLIGHTS

- Hydatidosis and cysticercosis are common zoonotic diseases in Nepal.
- Hydatidosis is more common in females, while there is no significant gender difference in cysticercosis cases.
- The lungs and liver are the most commonly affected sites for hydatid cysts, while neurocysticercosis is the most prevalent form of cysticercosis.
- Prevention and control measures for these diseases should be integrated into the healthcare system, with a particular focus on marginalized and underprivileged populations.
- The study's findings can inform targeted strategies for managing zoonotic diseases in Nepal and guide national policy-making and planning.

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sanitation practices. These diseases are particularly common in rural areas of Nepal, where people often live in close proximity to domestic animals. To develop effective prevention and control measures, it is crucial to have a comprehensive understanding of the demographic profile, anatomical distribution, and histopathological features of these diseases in the Nepalese population. Therefore, this study aims to determine the frequencies and analyze the demographic and histopathological characteristics of hydatidosis and cysticercosis in Nepal.

## Methods

### *Study design and setting*

The present study conducted a retrospective chart review of patients diagnosed with hydatidosis and cysticercosis at the Department of Pathology, Tribhuvan University Teaching Hospital, Nepal, between January 2013 and December 2019. Pathologically confirmed cases were included in the study, and information on demographics, clinical features, radiological findings, and histopathological characteristics were collected from patient records. Tribhuvan University Teaching Hospital is the largest referral center for parasitic infections and other diseases in Nepal.

### *Study population and sampling*

This study included all surgically treated patients who were provisionally diagnosed with hydatidosis or cysticercosis and confirmed through pathological analysis. A total of 138 cases of either hydatidosis or cysticercosis diagnosed over a period of 7 years were included in the study. The patients were not directly involved in the study, and ethical clearance was obtained from the Institutional Review Board of Tribhuvan University Institute of Medicine prior to conducting the research with approval number of 429 (6–11) $E^2$076/077.

### *Sample collection*

To collect the samples, a clean and labeled container with formalin was used, free from disinfectants and dried. The samples were then fixed in formalin and embedded in paraffin, and 5-micrometer sections were cut for staining with hematoxylin and eosin (H&E). Experienced pathologists with more than 15 years of experience examined and interpreted the H&E stained slides.

### *Data collection, management, and analysis*

The information regarding age, sex, location, size, organ involvement, and histopathological features were obtained from the records and were organized in an Excel spreadsheet. The data were then reviewed, classified, and coded systematically, and later transferred to Statistical Package for the Social Sciences (SPSS) version 26 (IBM) for analysis. The results were presented in tables showing the average for quantitative variables and percentages for categorical data. This study has been reported in line with the strengthening the reporting of cohort, cross-sectional and case-control studies in surgery (STROCSS) criteria[6].

## Results

Our study analyzed 138 cases of parasitic infections over the course of 7 years (January 2013–December 2019), including 112 cases of hydatid cysts and 26 cases of cysticercosis. The highest number of hydatid cysts cases were reported in 2019, while the most cases of cysticercosis were reported in 2014.

The age range of patients with HD and cysticercosis was between 5 and 74 years and 4 and 63 years, respectively, with mean ages of 33.86 and 25.39 years. Of the 112 hydatidosis cases, there were 44 (39.3%) males and 68 (61.7%) females, with the male-to-female ratio being 0.6:1. There were 14 (53.86%) males and 12 (46.15%) females with cysticercosis, with no apparent sex predilection. The age group with the highest number of hydatid cyst cases was 21–30 years, comprising 26 cases, followed by 31–40 years, comprising 23 cases. In contrast, the highest number of cysticercosis cases were observed in the age groups less than 10 years, comprising 7 cases, followed by 21–30 years and 41–50 years, each comprising 5 cases. The age-wise and sex-wise distribution of hydatid cysts and cysticercosis are presented in Figures 1, 2, respectively.

The size of the cysts ranges from 1 cm to 20 cm for hydatid cysts and 0.4 cm to 4 cm for cysticercosis. The anatomic locations of hydatid cysts (Table 1) are as follows: 47 (42%) in the lungs, 41 (36.6%) in the liver, 6 (5.4%) in the brain, 4 (3.60%) each in the kidney and spleen, and 1 case each (0.87%) in the pancreas, brain, peritoneal node, and scapula. Three cases (2.7%) had multiple organ involvement (liver and lung; liver, spleen, and peritoneum; and spleen and peritoneum). The exact location of four cases was missing from our record. Out of the 112 cases of hydatid cysts, 103 cases were noted to have hydatid cyst alone, while the remaining nine cases occurred in combination with other entities. The combinations included six cases of hydatid cyst with chronic cholecystitis and a single case each of congestive splenomegaly, cholangiocarcinoma, and cavernous hemangioma.

Out of 26 cysticercosis cases, three (11.53%) are found in the brain, two (7.69%) each in the arm and axilla, and one (3.84%) each in the vestibule, vitreous, thigh, subcutaneous, spinal cord, semispinalis capitis, parietal wall, lymph node, gall bladder, forehead, forearm, flank, chest wall, cheek, calf, and back, respectively. The location of three cases was not specified. The following presumptive clinical diagnoses for cysticercosis were

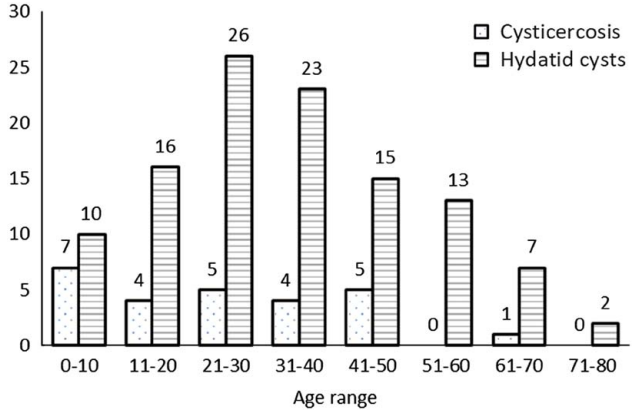


**Figure 1.** Age-wise distribution of cysticercosis and hydatid cysts.

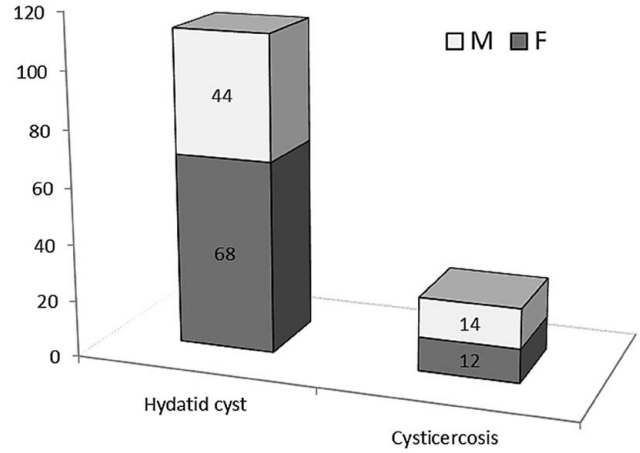


**Figure 2.** Sex-wise distribution of hydatid cyst and cysticercosis.

made prior to pathological confirmation: cystic lesions comprised the majority of cases ($n=10$) and were followed by cysticercosis ($n=6$), nodular swelling ($n=3$), and antibioma, cholelithiasis, ependymoma, parietal wall mass, and tuberculosis were all found in only a single case each. On gross examination, out of 26 cases of cysticercosis, 15 presented as cysts, 8 as nodules, 2 as gray-white tissues, and 1 case was incidentally noted in a cholecystectomy specimen.

## Discussion

Cysticercosis and echinococcosis are the two zoonotic parasitic diseases acquired from animals that act as obligate hosts for the associated parasites. These diseases have recently been included in the list of 'Neglected Tropical Diseases' by the WHO[1,7]. Echinococcosis, a zoonotic infection and one of the most important helminthic diseases worldwide, is caused by *Echinococcus* species, viz; *Echinococcus granulosus* and *Echinococcus multilocularis*[8]. Cysticercosis, caused by *Tenia solium* larva, is a major scourge in the developing world, with NCC being the commonest infestation of the central nervous system[5].

**Table 1**

**Location of hydatid cysts with organ involvement.**

| | Sex | | |
|---|---|---|---|
| **Hydatid cyst site** | **Male** | **Female** | **Total** |
| Lung | 21 | 26 | 47 |
| Liver | 17 | 24 | 41 |
| Brain | 2 | 4 | 6 |
| Kidney | 0 | 4 | 4 |
| Spleen | 2 | 2 | 4 |
| Pancreas | 0 | 1 | 1 |
| Peritoneal node | 0 | 1 | 1 |
| Scapula | 0 | 1 | 1 |
| Liver + Lung | 0 | 1 | 1 |
| Spleen + Peritoneum | 0 | 1 | 1 |
| Liver + Spleen + Peritoneum | 1 | 0 | 1 |
| Unspecified | 1 | 3 | 4 |
| Total | 44 | 68 | 112 |

There were some limitations in the studies done on hydatidosis and cysticercosis in Nepal. Many studies on cysticercosis have been done in stool samples, and there are limitations to studies done in tissue samples[9,10]. The data published so far suggests that the disease has become ingrained in the country, and can loom as a serious public health problem. This paper attempts to highlight, identify, and draw an inference regarding the burden of hydatidosis and cysticercosis in the Nepalese population by doing a retrospective 7-year study. This study will provide an estimate of the frequency of disease burden and help in the overall management of patients.

Definitive hosts for echinococcosis include canines as dogs, foxes, and wolves whereas intermediate hosts are sheep, buffalo, horses, cattle, pigs, and camels[11]. Humans become infected by consuming infected eggs or coming into contact with infected dog feces. This leads to human infection with the growth of cysts in various organs[12]. Hydatid cysts may develop in any organ but occur most frequently in liver followed by lungs and other organs[4,13]. Definitive hosts for cysticercosis includes humans carrying the intestinal adult tapeworm. Pigs, infected with the metacestode larval stage (cysticercus), act as the intermediate hosts. Undercooked pork consumption is the leading cause of T. solium tapeworm infection in humans. Pigs, on the other hand, get porcine cysticercosis (PCC) from eating T. solium eggs found in the feces of human tapeworm carriers. Cysticercosis occurs when humans accidentally ingest *T. solium* eggs and develop the larval stage of *T. solium* in different tissues[14].

Our study included 138 cases out of 53 013 biopsy specimens (0.26%) diagnosed over 7 years (January 2013–December 2019). There were 112 cases of hydatid cysts and 26 cases of cysticercosis.

Our study embodied 44 (39.3%) males and 68 (61.7%) females with hydatidosis, with a female preponderance (male-to-female ratio 0.6:1) and a mean age of 33.86 years. The observation was similar to the study done by Kayal and Hussain[15] in India with a male-to-female ratio of 1:2 and a mean age of 40 years. Maximum cases of HD were noted in the age group 21–30 years, comprising 26 cases in the current study, whereas Kayal A *et al.* in India narrated that the majority of the patients belonged to the fourth, fifth, and sixth decades of life. Studies from other countries such as Italy and Turkey have also reported that the incidence is higher in women than men, similar to our study[12,16,17].

The present study included 26 cases of cysticercosis, with 14 (53.86%) males and 12 (46.15%) females with no obvious gender predilection. The age groups 0–10 years had the most cases of cysticercosis, with seven cases, followed by 21–30 years and 41–50 years, with five cases each. The findings were congruent with the study done by Bhardwaj S *et al.* in Jammu and Kashmir, India with 30 patients, and the majority belonged to the age group of 21–30 years. However, there was a slight male preponderance with 18 (60%) males and 12 (40%) females in his study[18]. The study conducted by Amatya and Kimula[19] in Nepal also showed that there was no obvious gender predilection.

The maximum number of cases of hydatid cysts in the current study were seen in the lungs, which comprised 41.96% ($n=47$), followed by the liver at 36.66% ($n=41$). On the contrary, Zeinali M *et al.*[20], in an Iranian study observed that the liver and lungs had an infection rate of 61 and 20%, respectively. Likewise, studies conducted in Italy, Turkey, and Nepal have also reported

the liver to be the predominant organ affected by hydatid cysts[12,16,21].

Single organ involvement was seen in 105 cases (93.75%), whereas multiple organ involvement accounted for only three cases (2.6%) in the current study. Multiple organ involvement included the combinations of liver and lung; spleen and peritoneum; and liver, spleen, and peritoneum. The findings were similar to the study done in Turkey, with eight cases (7.1%) having multiple organ involvement. Multiple organ involvement in the Turkish study included the combinations of liver and spleen, liver and lung, liver and bladder, and liver and omentum[12].

The size of the cysts in our study ranged from 1 cm–20 cm for hydatid cysts. This was similar to the findings elucidated by Bektas S *et al.* and Ghartimagar D *et al.*, where the size ranged from 0.6 cm to 19 cm and 1.0 cm to 21 cm, respectively[12,21]. In our study, out of a total of 30 hydatid cysts with a size greater than 10 cm, 13 (43.33%) were in the lungs and 11 (36.66%) were in the liver. Other studies have reported that cyst size greater than 10 cm is one of the high-risk factors that significantly increases morbidity and mortality rates[22,23].

The size of the cysticerci cysts ranged from 0.4 cm to 4 cm in the current study, with an average size of 1.73 cm. This finding was congruent with the results of the study conducted by Amatya *et al.* in Nepal, with an average size of 1.9 cm[19].

The most frequent sites of cysticercosis occurrence are the subcutaneous layers, brain, muscles, heart, liver, lungs, and peritoneum, with orofacial cysticercosis being a rare episode[24]. Our study also encountered just a single case of oral cysticercosis, which was similar to the findings of the other studies[25,26]. Our study encountered only three cases of NCC, whereas a study conducted by Ojha *et al.* in Nepal observed 21 patients with NCC, with the calcified stage of NCC being the most frequent CT/MRI finding[27].

### *Strength and limitation*

The manuscript presents several strengths, including a comprehensive analysis of data collected over a 7-year period and the use of histopathological confirmation and cyst characterization, which is lacking in many previous studies from Nepal. However, some limitations need to be acknowledged. The study only included patients from a single institution, potentially missing cases treated elsewhere or not treated at all. The use of formalin-fixed, paraffin-embedded tissue samples for diagnosis is another limitation, as this may not be the most sensitive method for detecting cysticercosis and hydatidosis, potentially leading to misdiagnosis or underdiagnosis. Furthermore, patients who did not undergo surgical treatment or have their tissue samples submitted for pathological analysis may have been missed, limiting the study's generalizability.

## Conclusions

Our study sheds light on the clinical and pathological features of hydatidosis and cysticercosis in the Nepalese population. These zoonotic diseases impose a significant health burden, particularly among impoverished and marginalized communities. To reduce the overall burden of these diseases, prevention, and control measures must be integrated into the healthcare system. Detecting these diseases early is crucial for effective prevention, highlighting the need for further investigation in various regions of the country. Moreover, a better understanding of the epidemiological distribution of these diseases is crucial for informing national policy-making and planning.

## Ethical approval

The ethical approval for this study was obtained from the Institutional Review Board.

## Consent

This study qualifies for an exemption as it has not involved human subjects, and no informed consent is required because the data used is concealed.

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## Authors contributions

N.S., P.G., S.B.T. and U.M.: contributed in study conceptualization, drafting, revision of manuscript; S.B. and G.N.: involved in editing the draft, revision of manuscript and manuscript submission; N.S. and U.M.: contributed in histopathological diagnosis. All authors have approved the final article for submission.

## Conflicts of interest disclosure

No any conflict of interest to declare by the authors.

## Research registration unique identifying number (UIN)

This study was approved by the Institutional Review Board of the Institute of Medicine [Ref no: 429(6–11) E2076/077].

## Gurantor

Dr Nisha Sharma.

## Data availability statement

All relevant data and materials are provided with in manuscript.

## Provenance and peer review

Not commissioned, externally peer-reviewed.

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